

**Section 6.4.4, In Situ Gamma Spectroscopy Measurement Results Data Quality Review,**

**Page 6-11:** The text states that while differences in the in situ gamma spectroscopy results were not identified and that all in situ gamma spectroscopy measurement results are comparable; however, the criteria used to determine there were no differences in the results are not discussed. For example, the text does not state if ranges of static measurements in total counts per minute (cpm), or if values for specific radionuclides between survey units were compared. Please revise this section to provide a more detailed discussion that explains how the data were evaluated and what criteria were used as the basis for the conclusion that all in situ gamma measurement results were comparable.

**Section 6.4.4, In Situ Gamma Spectroscopy Measurement Results Data Quality Review,**

**Page 6-11:** The text does not state if one of the objectives was to identify elevated Cesium-137 (Cs-137) that may be present due to historical operations at the site. For example, it is unclear if one of the seven regions of interest (ROIs) was set to detect Cs-137. Please revise the text to clarify whether one objective was to identify areas with elevated Cs-137.

**Section 6.4.4, In Situ Gamma Spectroscopy Measurement Results Data Quality Review,**

**Page 6-11:** This section states, "No sensitivity calculations were performed beyond the ability to identify peaks within the regions of interest. This process was sensitive enough to accomplish the survey objectives;" however, the text does not state what criteria were used to determine that the process was sensitive enough to accomplish the survey objectives, or to what survey objectives this statement is referring. For example, if the survey objective was to identify potential discreet radiological sources such as historical deck markers, then this section should be revised to state that was the basis for the sensitivity evaluation. Please revise this section to provide the criteria used to assess whether the sensitivity of the in situ measurements was sufficient, and to provide a more detailed description that explains how the in situ measurements were determined to have met the sensitivity requirements.

**Section 6.4.5, Alpha/Beta Scan Measurement Results Data Quality Review, Page 6-12:**

The relevant Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) calculations should be provided in the text. The text states that the alpha scan MDC calculations and upper prediction level calculations identified upper bounds on the alpha scan data in the 200 to 250 dpm/100 cm<sup>2</sup> range. MARSSIM (EPA et al., 2000) Section 5.5.2.4 provides for increasing the number of measurements performed in a survey unit to account for MDC values that do not achieve the survey objectives. As described in this section (The number of measurements in each survey unit was increased by a factor of three from 18 to 54 to reflect the calculated upper bounds on the alpha scan data (200 to 250 dpm/100 cm<sup>2</sup>) and allow for an alpha scan MDC as high as 300 dpm/100 cm<sup>2</sup>. The work plan states that "The assumptions regarding the number of measurements will be evaluated during the field effort and additional static measurements will be collected as required." A minimum of 54 alpha and beta static measurements were performed in each SU to account for the scan MDC not achieving the survey objective of measuring concentrations below the specified release criteria and II. However, this section does not specify the MARSSIM calculations used to determine that increasing the number of measurements by a factor of three would satisfy the criterion of meeting the survey objectives. Please revise this section to include the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)-based calculations to verify that 54 samples per survey unit was adequate.

**Commented [A1]:** Does the statement that no differences were identified refer to differences between SUs? If so and SUs differ, how is it determined if the difference is significant? And what are the consequences if the difference is significant?

**Commented [A2R1]:** a) The statement appears to refer to differences between background and SU measurements but it is not clear this is the case. It is not clear how it would be relevant to compare SU results with each other, given that the physical configurations were different (e.g., some measurements were taken on horizontal surfaces, some were collected vertical surfaces, and some were collected within rectangular holes for impellers. b) It isn't clear what differences are significant or how the comparisons were done. That is the basis for this comment. c) If the differences are significant, then the statement that all gamma measurement results are comparable is untrue and there could be contamination.

**Commented [A3R1]:** Thanks. Can you revise the comment to be more specific about what else we would like them to do or explain? There is one sentence in the section that I expect they would describe as a partial explanation: "If counts in the regions of interest increased by approximately the same amount and no additional peaks were observed, the increased gamma radiation resulted from variations in naturally occurring radionuclides and was not identified as contamination."

**Commented [A4]:** I'm not clear what the comment is asking for. Isn't Cs-137 an ROC for this study? Doesn't that mean that detecting any elevated Cs-137 was an objective?

**Commented [A5R4]:** Cs-137 is an ROC for this study. However, it is not clear if one of the 7 regions of interest mentioned in the text of Section 6.4.4 was set to detect Cs-137. Perhaps the request should be to specify if one of the 7 ROIs was set for Cs-137. See potential edit.

**Commented [A6R4]:** It appears they did not. See page 337 of the PDF.

**Commented [A7]:** Does the work plan identify detection limits as a measure of the required sensitivity? (e.g., Table 5 in the work plan). Is the comment asking whether the targeted detection limits were achieved?

**Commented [A8R7]:** Yes. Table 5 in the WP lists assumed measurement sensitivity. The text in Report Section 6.4.4 states that no sensitivity calculations were performed other than to do ROIs, so it is not clear if the instrument sensitivity was sufficient. Some explanatory text and possibly a table comparing the assumed sensitivity in WP table 5 with the actual sensitivity should be provided.

**Commented [A9R7]:** Can you edit the comment to reflect your reply?

**Commented [A10]:** I don't understand what they increased. The 54 systematic samples were already specified in the work plan. Please explain.

**Commented [A11R10]:** See Final Rev 2 WP section 5.7.3, pdf page 29, paragraph under the calculations – the reason was to meet RASO requirements. They calculated 18 measurements, but then the WP says, "additional static measurements are necessary to meet the RASO guidance to increase the density of static measurements by a factor of 3 when basing the alpha detection probability on the 300 dpm/100 cm<sup>2</sup> hotspot limit. Fifty-four alpha/beta static measurements will be collected per SU."

**Commented [A12R10]:** Please review my attempt to make the comment more concise and correct if needed.

- **Figure 18, SU3 Gamma Scan Results - Berth 62 & 63 Vertical Surfaces:** Figure 18 includes two summary data insets, one for concrete and one for gamma scans of metal surfaces, but the figure does not specify if the Z-score exceedances (colored dots) depicted on this figure were from the concrete or the metal matrix. It is noted that the highest result reported at 13,940 cpm, which is color coded orange to denote a Z-Score above 3, is identified as being from the scanning of the metal surfaces but it is unclear if all z-score exceedances depicted in this figure are from the gamma scanning of the metal, concrete, or both. Please revise the figure to clarify if the color coded gamma scanning results are from the concrete scans or metal scans.

- **Figure 18, SU3 Gamma Scan Results - Berth 62 & 63 Vertical Surfaces:** Figure 18 depicts a Z-Score exceedance on metal of 10.5, which significantly exceeds the Z-score trigger of three for additional investigation; therefore, an explanation for this large exceedance should be provided. For example, Section 6.1.1.3 (Survey Unit 3) should discuss why such a large deviation in the Z-score was obtained at this location and whether follow-up gamma static measurements and/or gross alpha/beta measurements also indicated elevated radioactivity. Please revise the Report to address the potential reasons behind the elevated gamma scan result and what alpha/beta scans and statics or a follow-up gamma static measurement indicated about the level and types of radioactivity present at this location.

- **Appendix D, Reference Background Area Data:** Appendix D does not include background data for gamma scanning surveys for concrete or metal or background data for the Canberra InSpector 1000 static measurements for concrete and metal. Please revise the Report to include background data for gamma scans using the Ludlum Model 44-20 3-inch by 3-inch NaI gamma scintillation detector and the RS-700. In addition, please revise the Report to include a list of the background data for the InSpector 1000 used for the static measurements.

**Commented [A13]:** What is the value of knowing whether the exceedances are due to concrete and/or metal?

**Commented [A14R13]:** Elevated measurements on concrete could be NORM associated with concrete and/or due in part to natural K-40 in seawater that was absorbed by the concrete over time. Elevated measurements on metal may be more indicative of contamination.

**Commented [A15R13]:** We could ask but I can't see the answer changing anything. The protocol is the same regardless of material - isn't it? They were suppose to do a gamma static and an alpha/beta scan at the 74 locations where the gamma scan exceeded z=3?

**Commented [A16]:** The text says there were 22, 16, and 37 locations in the 3 SUs that exceeded the IL. What is the value of asking about only the max of those 75 exceedances?

**Commented [A17R16]:** This Z-score is exceptionally large, so additional information appears warranted. For example, it is possible that this location is contaminated.

**Commented [A18R16]:** I feel like it's arbitrary to ask them to more intensively investigate one of 75 exceedances, even if it is the max. And, as in the above comment, I can't see the response changing anything. Matching up the location with the z score of 10.5, it looks like the gamma static at that location (SU3-GB35 (6385) was below the IL (Figure 24). Hard to tell if I'm looking at the right location but it looks like the alpha scan result at the same location (Figure 34) did, however, exceed the RG. Maybe the more useful comment is the fact that they only followed up on a small fraction of the alpha scan exceedances.

**Commented [A19]:** What about summary statistics in Table 5? Are they also missing for some of the instruments?

KB: Yes, there are instruments missing from Table 5.

I see gamma static RBA results on the last page of Appendix D for the Ludlum. Scan background measurements are a separate set of measurements?

KB: Yes. There should be a separate set of scan background measurements for gamma surveys.

I see a Field Change Request form in Appendix B (pp. B-5 and B-6) that says they will use an area in the Finger Piers as a concrete background area after scabbling the top surface. It also says "Scans, statics and concrete laboratory samples will be collected before and after scabbling and the information will be provided in the report." Did they do that?

KB: No, the before data (scans and statics, concrete samples), and background scanning data is missing from the report. The statics provided in Appendix D may be the "after" statics.

Is that the area referred to in Section 4.3.1? It says "A small concrete pad adjacent to SU 3 was used as the RBA for gamma measurements. ... This small pad was non-impacted because it was separate from the submarine pens and could not have been used for ship repair or other radiological operations due to its small size."

KB: Not clear. Section 4.3.1 does not discuss whether this pad adjacent to SU 3 was scabbled or whether before and after scan and static measurements were collected. Also not clear if anything adjacent to SU 3 would have been unimpacted because of decontamination efforts after

**Commented [A20R19]:** Can you modify the comment or add additional comments to address whichever of my observations you think are worth commenting on?

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